

feedstock usage and sorbent usage (as applicable) in § 98.163(b), including, but not limited to, calibration of weighing equipment, fuel and feedstock flow meters, and other measurement devices. The estimated accuracy of measurements made with these devices must also be recorded, and the technical basis for these estimates must be provided.

[74 FR 56374, Oct. 30, 2009, as amended at 78 FR 71956, Nov. 29, 2013]

**§ 98.168 Definitions.**

All terms used in this subpart have the same meaning given in the Clean Air Act and subpart A of this part.

**Subpart Q—Iron and Steel Production**

**§ 98.170 Definition of the source category.**

The iron and steel production source category includes facilities with any of the following processes: taconite iron ore processing, integrated iron and steel manufacturing, cokemaking not collocated with an integrated iron and steel manufacturing process, direct reduction furnaces not collocated with an integrated iron and steel manufacturing process, and electric arc furnace (EAF) steelmaking not collocated with an integrated iron and steel manufacturing process. Integrated iron and steel manufacturing means the production of steel from iron ore or iron ore pellets. At a minimum, an integrated iron and steel manufacturing process has a basic oxygen furnace for refining molten iron into steel. Each coke-making process and EAF process located at a facility with an integrated iron and steel manufacturing process is part of the integrated iron and steel manufacturing facility.

[74 FR 56374, Oct. 30, 2009, as amended at 78 FR 71955, Nov. 29, 2013]

**§ 98.171 Reporting threshold.**

You must report GHG emissions under this subpart if your facility contains an iron and steel production process and the facility meets the requirements of either § 98.2(a)(1) or (2).

**§ 98.172 GHGs to report.**

(a) You must report under subpart C of this part (General Stationary Fuel Combustion Sources) the emissions of CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O from each stationary combustion unit following the requirements of subpart C except for flares. Stationary combustion units include, but are not limited to, by-product recovery coke oven battery combustion stacks, blast furnace stoves, boilers, process heaters, reheat furnaces, annealing furnaces, flame suppression, ladle reheaters, and other miscellaneous combustion sources.

(b) You must report CO<sub>2</sub> emissions from flares that burn blast furnace gas or coke oven gas according to the procedures in § 98.253(b)(1) of subpart Y (Petroleum Refineries) of this part. When using the alternatives set forth in § 98.253(b)(1)(ii)(B) and § 98.253(b)(1)(iii)(C), you must use the default CO<sub>2</sub> emission factors for coke oven gas and blast furnace gas from Table C–1 to subpart C in Equations Y–2 and Y–3 of subpart Y. You must report CH<sub>4</sub> and N<sub>2</sub>O emissions from flares according to the requirements in § 98.33(c)(2) using the emission factors for coke oven gas and blast furnace gas in Table C–2 to subpart C of this part.

(c) You must report process CO<sub>2</sub> emissions from each taconite indurating furnace; basic oxygen furnace; non-recovery coke oven battery combustion stack; coke pushing process; sinter process; EAF; decarburization vessel; and direct reduction furnace by following the procedures in this subpart.

[74 FR 56374, Oct. 30, 2009, as amended at 75 FR 66463, Oct. 28, 2010]

**§ 98.173 Calculating GHG emissions.**

You must calculate and report the annual process CO<sub>2</sub> emissions from each taconite indurating furnace, basic oxygen furnace, non-recovery coke oven battery, sinter process, EAF, decarburization vessel, and direct reduction furnace using the procedures in either paragraph (a) or (b) of this section. Calculate and report the annual process CO<sub>2</sub> emissions from the coke pushing process according to paragraph (c) of this section.

## Environmental Protection Agency

## § 98.173

(a) Calculate and report under this subpart the process CO<sub>2</sub> emissions by operating and maintaining CEMS according to the Tier 4 Calculation Methodology in § 98.33(a)(4) and all associated requirements for Tier 4 in subpart C of this part (General Stationary Fuel Combustion Sources).

(b) Calculate and report under this subpart the process CO<sub>2</sub> emissions using the procedure in paragraph (b)(1) or (b)(2) of this section.

(1) *Carbon mass balance method.* Calculate the annual mass emissions of CO<sub>2</sub> for the process as specified in paragraphs (b)(1)(i) through (b)(1)(vii) of this section. The calculations are based

on the annual mass of inputs and outputs to the process and an annual analysis of the respective weight fraction of carbon as determined according to the procedures in § 98.174(b). If you have a process input or output other than CO<sub>2</sub> in the exhaust gas that contains carbon that is not included in Equations Q-1 through Q-7 of this section, you must account for the carbon and mass rate of that process input or output in your calculations according to the procedures in § 98.174(b)(5).

(i) For taconite indurating furnaces, estimate CO<sub>2</sub> emissions using Equation Q-1 of this section.

$$CO_2 = \frac{44}{12} * \left[ (F_s) * (C_{sf}) + (F_g) * (C_{gf}) * \frac{MW}{MVC} * 0.001 + (F_l) * (C_{lf}) * 0.001 + (O) * (C_o) - (P) * (C_p) - (R) * (C_R) \right] \quad (\text{Eq. Q-1})$$

Where:

CO<sub>2</sub> = Annual CO<sub>2</sub> mass emissions from the taconite indurating furnace (metric tons).

44/12 = Ratio of molecular weights, CO<sub>2</sub> to carbon.

(F<sub>s</sub>) = Annual mass of the solid fuel used (metric tons).

(C<sub>sf</sub>) = Carbon content of the solid fuel, from the fuel analysis (expressed as a decimal fraction).

(F<sub>g</sub>) = Annual volume of the gaseous fuel used (scf).

(C<sub>gf</sub>) = Average carbon content of the gaseous fuel, from the fuel analysis results (kg C per kg of fuel).

MW = Molecular weight of the gaseous fuel (kg/kg-mole).

MVC = Molar volume conversion factor (849.5 scf per kg-mole at standard conditions).

0.001 = Conversion factor from kg to metric tons.

(F<sub>l</sub>) = Annual volume of the liquid fuel used (gallons).

(C<sub>lf</sub>) = Carbon content of the liquid fuel, from the fuel analysis results (kg C per gallon of fuel).

(O) = Annual mass of greenball (taconite) pellets fed to the furnace (metric tons).

(C<sub>o</sub>) = Carbon content of the greenball (taconite) pellets, from the carbon analysis results (expressed as a decimal fraction).

(P) = Annual mass of fired pellets produced by the furnace (metric tons).

(C<sub>p</sub>) = Carbon content of the fired pellets, from the carbon analysis results (expressed as a decimal fraction).

(R) = Annual mass of air pollution control residue collected (metric tons).

(C<sub>R</sub>) = Carbon content of the air pollution control residue, from the carbon analysis results (expressed as a decimal fraction).

(ii) For basic oxygen process furnaces, estimate CO<sub>2</sub> emissions using Equation Q-2 of this section.

$$CO_2 = \frac{44}{12} * \left[ (Iron) * (C_{Iron}) + (Scrap) * (C_{Scrap}) + (Flux) * (C_{Flux}) + (Carbon) * (C_{Carbon}) - (Steel) * (C_{Steel}) - (Slag) * (C_{Slag}) - (R) * (C_R) \right] \quad (\text{Eq. Q-2})$$

Where:

CO<sub>2</sub> = Annual CO<sub>2</sub> mass emissions from the basic oxygen furnace (metric tons).

44/12 = Ratio of molecular weights, CO<sub>2</sub> to carbon.

(Iron) = Annual mass of molten iron charged to the furnace (metric tons).

(C<sub>Iron</sub>) = Carbon content of the molten iron, from the carbon analysis results (expressed as a decimal fraction).

(Scrap) = Annual mass of ferrous scrap charged to the furnace (metric tons).

(C<sub>Scrap</sub>) = Carbon content of the ferrous scrap, from the carbon analysis results (expressed as a decimal fraction).

(Flux) = Annual mass of flux materials (e.g., limestone, dolomite) charged to the furnace (metric tons).

(C<sub>Flux</sub>) = Carbon content of the flux materials, from the carbon analysis results (expressed as a decimal fraction).

(Carbon) = Annual mass of carbonaceous materials (e.g., coal, coke) charged to the furnace (metric tons).

(C<sub>Carbon</sub>) = Carbon content of the carbonaceous materials, from the carbon analysis results (expressed as a decimal fraction).

(Steel) = Annual mass of molten raw steel produced by the furnace (metric tons).

(C<sub>Steel</sub>) = Carbon content of the steel, from the carbon analysis results (expressed as a decimal fraction).

(Slag) = Annual mass of slag produced by the furnace (metric tons).

(C<sub>Slag</sub>) = Carbon content of the slag, from the carbon analysis (expressed as a decimal fraction).

(R) = Annual mass of air pollution control residue collected (metric tons).

(C<sub>R</sub>) = Carbon content of the air pollution control residue, from the carbon analysis results (expressed as a decimal fraction).

(iii) For non-recovery coke oven batteries, estimate CO<sub>2</sub> emissions using Equation Q-3 of this section.

$$CO_2 = \frac{44}{12} * [(Coal) * (C_{Coal}) - (Coke) * (C_{Coke}) - (R) * (C_R)] \quad (\text{Eq. Q-3})$$

Where:

CO<sub>2</sub> = Annual CO<sub>2</sub> mass emissions from the non-recovery coke oven battery (metric tons).

44/12 = Ratio of molecular weights, CO<sub>2</sub> to carbon.

(Coal) = Annual mass of coal charged to the battery (metric tons).

(C<sub>Coal</sub>) = Carbon content of the coal, from the carbon analysis results (expressed as a decimal fraction).

(Coke) = Annual mass of coke produced by the battery (metric tons).

(C<sub>Coke</sub>) = Carbon content of the coke, from the carbon analysis results (expressed as a decimal fraction).

(R) = Annual mass of air pollution control residue collected (metric tons).

(C<sub>R</sub>) = Carbon content of the air pollution control residue, from the carbon analysis results (expressed as a decimal fraction).

(iv) For sinter processes, estimate CO<sub>2</sub> emissions using Equation Q-4 of this section.

$$CO_2 = \frac{44}{12} * [(F_g) * (C_{gf}) * \frac{MW}{MVC} * 0.001 + (Feed) * (C_{Feed}) - (Sinter) * (C_{Sinter}) - (R) * (C_R)] \quad (\text{Eq. Q-4})$$

Where:

CO<sub>2</sub> = Annual CO<sub>2</sub> mass emissions from the sinter process (metric tons).

44/12 = Ratio of molecular weights, CO<sub>2</sub> to carbon.

(F<sub>g</sub>) = Annual volume of the gaseous fuel used (scf).

(C<sub>gf</sub>) = Carbon content of the gaseous fuel, from the fuel analysis results (kg C per kg of fuel).

MW = Molecular weight of the gaseous fuel (kg/kg-mole).

MVC = Molar volume conversion factor (849.5 scf per kg-mole at standard conditions).

0.001 = Conversion factor from kg to metric tons.

(Feed) = Annual mass of sinter feed material (metric tons).

(C<sub>Feed</sub>) = Carbon content of the mixed sinter feed materials that form the bed entering the sintering machine, from the carbon analysis results (expressed as a decimal fraction).

(Sinter) = Annual mass of sinter produced (metric tons).

(C<sub>Sinter</sub>) = Carbon content of the sinter pellets, from the carbon analysis results (expressed as a decimal fraction).

(R) = Annual mass of air pollution control residue collected (metric tons).

(C<sub>R</sub>) = Carbon content of the air pollution control residue, from the carbon analysis results (expressed as a decimal fraction).

(v) For EAFs, estimate CO<sub>2</sub> emissions using Equation Q-5 of this section.

$$CO_2 = \frac{44}{12} * \left[ (Iron) * (C_{Iron}) + (Scrap) * (C_{Scrap}) + (Flux) * (C_{Flux}) + (Electrode) * (C_{Electrode}) + (Carbon) * (C_{Carbon}) - (Steel) * (C_{Steel}) + (F_g) * (C_{gf}) * \frac{MW}{MVC} * 0.001 - (Slag) * (C_{Slag}) - (R) * (CR) \right]$$

(Eq. Q-5)

Where:

CO<sub>2</sub> = Annual CO<sub>2</sub> mass emissions from the EAF (metric tons).44/12 = Ratio of molecular weights, CO<sub>2</sub> to carbon.

(Iron) = Annual mass of direct reduced iron (if any) charged to the furnace (metric tons).

(C<sub>Iron</sub>) = Carbon content of the direct reduced iron, from the carbon analysis results (expressed as a decimal fraction).

(Scrap) = Annual mass of ferrous scrap charged to the furnace (metric tons).

(C<sub>Scrap</sub>) = Carbon content of the ferrous scrap, from the carbon analysis results (expressed as a decimal fraction).(Flux) = Annual mass of flux materials (*e.g.*, limestone, dolomite) charged to the furnace (metric tons).(C<sub>Flux</sub>) = Carbon content of the flux materials, from the carbon analysis results (expressed as a decimal fraction).

(Electrode) = Annual mass of carbon electrode consumed (metric tons).

(C<sub>Electrode</sub>) = Carbon content of the carbon electrode, from the carbon analysis results (expressed as a decimal fraction).(Carbon) = Annual mass of carbonaceous materials (*e.g.*, coal, coke) charged to the furnace (metric tons).(C<sub>Carbon</sub>) = Carbon content of the carbonaceous materials, from the carbon analysis results (expressed as a decimal fraction).

(Steel) = Annual mass of molten raw steel produced by the furnace (metric tons).

(C<sub>Steel</sub>) = Carbon content of the steel, from the carbon analysis results (expressed as a decimal fraction).(F<sub>g</sub>) = Annual volume of the gaseous fuel used (scf at 60 degrees F and one atmosphere).(C<sub>gf</sub>) = Average carbon content of the gaseous fuel, from the fuel analysis results (kg C per kg of fuel).

(MW) = Molecular weight of the gaseous fuel (kg/kg-mole).

(MVC) = Molar volume conversion factor (836.6 scf per kg-mole at standard conditions of 60 degrees F and one atmosphere).

(0.001) = Conversion factor from kg to metric tons.

(Slag) = Annual mass of slag produced by the furnace (metric tons).

(C<sub>Slag</sub>) = Carbon content of the slag, from the carbon analysis results (expressed as a decimal fraction).

(R) = Annual mass of air pollution control residue collected (metric tons).

(C<sub>R</sub>) = Carbon content of the air pollution control residue, from the carbon analysis results (expressed as a decimal fraction).(vi) For decarburization vessels, estimate CO<sub>2</sub> emissions using Equation Q-6 of this section.

$$CO_2 = \frac{44}{12} * \{ (Steel) * [(C_{Steelin}) - (C_{Steelout})] - (R) * (C_R) \}$$

(Eq. Q-6)

Where:

CO<sub>2</sub> = Annual CO<sub>2</sub> mass emissions from the decarburization vessel (metric tons).44/12 = Ratio of molecular weights, CO<sub>2</sub> to carbon.

(Steel) = Annual mass of molten steel charged to the vessel (metric tons).

(C<sub>Steelin</sub>) = Carbon content of the molten steel before decarburization, from the carbon analysis results (expressed as a decimal fraction).(C<sub>Steelout</sub>) = Carbon content of the molten steel after decarburization, from the carbon analysis results (expressed as a decimal fraction).

(R) = Annual mass of air pollution control residue collected (metric tons).

(C<sub>R</sub>) = Carbon content of the air pollution control residue, from the carbon analysis results (expressed as a decimal fraction).(vii) For direct reduction furnaces, estimate CO<sub>2</sub> emissions using Equation Q-7 of this section.

$$CO_2 = \frac{44}{12} * \left[ (F_g) * (C_{gf}) * \frac{MW}{MVC} * 0.001 + (Ore) * (C_{Ore}) \right. \\ \left. + (Carbon) * (C_{Carbon}) + (Other) * (C_{Other}) \right. \\ \left. - (Iron) * (C_{Iron}) - (NM) * (C_{NM}) - (R) * (C_R) \right] \quad (\text{Eq. Q-7})$$

Where:

CO<sub>2</sub> = Annual CO<sub>2</sub> mass emissions from the direct reduction furnace (metric tons).

44/12 = Ratio of molecular weights, CO<sub>2</sub> to carbon.

(F<sub>g</sub>) = Annual volume of the gaseous fuel used (scf).

(C<sub>gf</sub>) = Carbon content of the gaseous fuel, from the fuel analysis results (kg C per kg of fuel).

MW = Molecular weight of the gaseous fuel (kg/kg-mole).

MVC = Molar volume conversion factor (849.5 scf per kg-mole at standard conditions).

0.001 = Conversion factor from kg to metric tons.

(Ore) = Annual mass of iron ore or iron ore pellets fed to the furnace (metric tons).

(C<sub>Ore</sub>) = Carbon content of the iron ore or iron ore pellets, from the carbon analysis results (expressed as a decimal fraction).

(Carbon) = Annual mass of carbonaceous materials (e.g., coal, coke) charged to the furnace (metric tons).

(C<sub>Carbon</sub>) = Carbon content of the carbonaceous materials, from the carbon analysis results (expressed as a decimal fraction).

(Other) = Annual mass of other materials charged to the furnace (metric tons).

(C<sub>Other</sub>) = Average carbon content of the other materials charged to the furnace, from the carbon analysis results (expressed as a decimal fraction).

(Iron) = Annual mass of iron produced (metric tons).

(C<sub>Iron</sub>) = Carbon content of the iron, from the carbon analysis results (expressed as a decimal fraction).

(NM) = Annual mass of non-metallic materials produced by the furnace (metric tons).

(C<sub>NM</sub>) = Carbon content of the non-metallic materials, from the carbon analysis results (expressed as a decimal fraction).

(R) = Annual mass of air pollution control residue collected (metric tons).

(C<sub>R</sub>) = Carbon content of the air pollution control residue, from the carbon analysis results (expressed as a decimal fraction).

(2) *Site-specific emission factor method.* Conduct a performance test and measure CO<sub>2</sub> emissions from all exhaust stacks for the process and measure either the feed rate of materials into the process or the production rate during the test as described in paragraphs (b)(2)(i) through (b)(2)(iv) of this section.

(i) You must measure the process production rate or process feed rate, as applicable, during the performance test according to the procedures in § 98.174(c)(5) and calculate the average rate for the test period in metric tons per hour.

(ii) You must calculate the hourly CO<sub>2</sub> emission rate using Equation Q-8 of this section and determine the average hourly CO<sub>2</sub> emission rate for the test.

$$CO_2 = 5.18 \times 10^{-7} * C_{CO_2} * Q * \left( \frac{100 - \%H_2O}{100} \right) \quad (\text{Eq. Q-8})$$

Where:

CO<sub>2</sub> = CO<sub>2</sub> mass emission rate, corrected for moisture (metric tons/hr).

5.18 × 10<sup>-7</sup> = Conversion factor (metric tons/scf-% CO<sub>2</sub>).

C<sub>CO<sub>2</sub></sub> = Hourly CO<sub>2</sub> concentration, dry basis (% CO<sub>2</sub>).

Q = Hourly stack gas volumetric flow rate (scfh).

%H<sub>2</sub>O = Hourly moisture percentage in the stack gas.

(iii) You must calculate a site-specific emission factor for the process in metric tons of CO<sub>2</sub> per metric ton of

feed or production, as applicable, by dividing the average hourly CO<sub>2</sub> emission rate during the test by the average hourly feed or production rate during the test.

(iv) You must calculate CO<sub>2</sub> emissions for the process by multiplying the emission factor by the total amount of feed or production, as applicable, for the reporting period.

(c) You must determine emissions of CO<sub>2</sub> from the coke pushing process in mtCO<sub>2</sub>e by multiplying the metric tons of coal charged to the by-product recovery and non-recovery coke ovens during the reporting period by 0.008.

(d) If GHG emissions from a taconite indurating furnace, basic oxygen furnace, non-recovery coke oven battery, sinter process, EAF, decarburization vessel, or direct reduction furnace are vented through a stack equipped with a CEMS that complies with the Tier 4 methodology in subpart C of this part, or through the same stack as any combustion unit or process equipment that reports CO<sub>2</sub> emissions using a CEMS that complies with the Tier 4 Calculation Methodology in subpart C of this part (General Stationary Fuel Combustion Sources), then the calculation methodology in paragraph (b) of this section shall not be used to calculate process emissions. The owner or operator shall report under this subpart the combined stack emissions according to the Tier 4 Calculation Methodology in § 98.33(a)(4) and comply with all associated requirements for Tier 4 in subpart C of this part (General Stationary Fuel Combustion Sources).

[74 FR 56374, Oct. 30, 2009, as amended at 75 FR 66464, Oct. 28, 2010; 78 FR 71956, Nov. 29, 2013]

#### § 98.174 Monitoring and QA/QC requirements.

(a) If you operate and maintain a CEMS that measures CO<sub>2</sub> emissions consistent with subpart C of this part, you must meet the monitoring and QA/QC requirements of § 98.34(c).

(b) If you determine CO<sub>2</sub> emissions using the carbon mass balance procedure in § 98.173(b)(1), you must:

(1) Except as provided in paragraph (b)(4) of this section, determine the mass of each process input and output other than fuels using the same plant

instruments or procedures that are used for accounting purposes (such as weigh hoppers, belt weigh feeders, weighed purchased quantities in shipments or containers, combination of bulk density and volume measurements, etc.), record the totals for each process input and output for each calendar month, and sum the monthly mass to determine the annual mass for each process input and output. Determine the mass rate of fuels using the procedures for combustion units in § 98.34. No determination of the mass of steel output from decarburization vessels is required.

(2) Except as provided in paragraph (b)(4) of this section, determine the carbon content of each process input and output annually for use in the applicable equations in § 98.173(b)(1) based on analyses provided by the supplier or by the average carbon content determined by collecting and analyzing at least three samples each year using the standard methods specified in paragraphs (b)(2)(i) through (b)(2)(vi) of this section as applicable.

(i) ASTM C25-06, Standard Test Methods for Chemical Analysis of Limestone, Quicklime, and Hydrated Lime (incorporated by reference, *see* § 98.7) for limestone, dolomite, and slag.

(ii) ASTM D5373-08 Standard Test Methods for Instrumental Determination of Carbon, Hydrogen, and Nitrogen in Laboratory Samples of Coal (incorporated by reference, *see* § 98.7) for coal, coke, and other carbonaceous materials.

(iii) ASTM E1915-07a, Standard Test Methods for Analysis of Metal Bearing Ores and Related Materials by Combustion Infrared-Absorption Spectrometry (incorporated by reference, *see* § 98.7) for iron ore, taconite pellets, and other iron-bearing materials.

(iv) ASTM E1019-08, Standard Test Methods for Determination of Carbon, Sulfur, Nitrogen, and Oxygen in Steel, Iron, Nickel, and Cobalt Alloys by Various Combustion and Fusion Techniques (incorporated by reference, *see* § 98.7) for iron and ferrous scrap.

(v) ASM CS-104 UNS No. G10460—Alloy Digest April 1985 (Carbon Steel of Medium Carbon Content) (incorporated by reference, *see* § 98.7); ISO/TR 15349-1:1998, Unalloyed steel—Determination